Drinking Water Corrosion-Related Engineering Report Requirements

Rules Affected: Title 30 of the *Texas Administrative Code* (TAC) §290.42(n), 30 TAC §290.117(f) and 30 TAC §290.39(j)

Purpose and Background

Public water systems (PWS), as part of a drinking water plan review approval or prior to granting an exception request, may be required to submit an engineering report associated with water that appears to be slightly corrosive or corrosive/aggressive in nature. This outline was developed as a guide for the contents of an engineering report submitted by a Texas Professional Engineer (P.E.) on behalf of a PWS. This guidance is not intended for lead or copper action level exceeders that are required to prepare a Corrosion Control Study (CCST) under the Lead and Copper Rule, but may be used as a supplemental tool that can be used along-side the CCST form (TCEQ Form 20495). This outline may also be used by systems proactively reviewing the corrosivity of their water. Engineering reports required to be submitted due to slightly corrosive or corrosive/aggressive water may be submitted to the following address depending on which team is involved:

Plan Review Team (MC-159)
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, Texas 78711-3087

Technical Review and Oversight Team (MC-159)
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, Texas 78711-3087

Guidance

1. Historical Data

   When reviewing the corrosive nature of water in a particular water system, it is necessary to have historical data for review. The following is a general guideline for gathering and presenting the necessary historical baseline data to include within the required corrosion-related engineering report framework.

   a) Provide known pipe material information for the current distribution system and service lines including pipe material, pipe sizes, and age of piping. Include estimated system percentages for each pipe material (percentage polyvinyl chloride (PVC), polyethylene, ductile iron (DI), galvanized, asbestos cement (AC), steel, concrete, lead, copper, etc.). Include how this information has been obtained such as record drawings, past waterline replacement projects, purchase orders and/or documentation maintained within GIS and/or water distribution models.

   b) Provide a current water treatment process description including sources and a treatment schematic. Provide a historical perspective of the changes to the

treatment process with dates and reasons for the process changes for the last 5 years.

c) Include a summary of all historical information and Water Quality Parameter (WQP) data for the last 5 years. Provide a complete description of when and why the data was taken and provide any context as it relates to system changes, and specifically include all changes in treatment systems and processes.

d) Provide information on whether the PWS has a history of lead and/or copper exceedances or other corrosivity issues.

Please note that if the PWS is currently an Action Level Exceeder (ALE) for the Lead and Copper Rule (LCR) and is required to conduct a CCST, then refer to the Texas Commission on Environmental Quality (TCEQ) Form 20495 Corrosion Control Study for Small and Medium PWS and Treatment Recommendations, which can be obtained from the following weblink:

www.tceq.texas.gov/drinkingwater/chemicals/lead_copper/lead-copper.html

e) Research analogous system's data that use the same water source(s) and use similar treatment processes.

2. Existing Conditions

If the engineering report was triggered by a plan review or the exception process in either the TCEQ Plan Review Team (PRT) or Technical Review and Oversight Team (TROT), the PWS is likely in the process of making system changes such as adding a new source or treatment changes. These changes can have a direct effect on the finished water corrosivity and must be analyzed either in a small scale demonstration study or prior to implementation.

a) Provide the complete analytical laboratory results for the WQP data, including appropriate chain of custody with Quality Assurance/Quality Control data. Provide the 'field pH and temperature' associated with the sampled WQPs.

b) Provide whether the PWS has elevated Aluminum, Iron or Manganese levels at the Entry Point (EP). This data can impact corrosion control treatment if corrosion control treatment is required.

c) Perform corrosion indices calculations, utilizing theoretical water corrosivity research (such as Langelier Saturation Index (LSI), Ryzner Stability Index (RSI) and the Aggressive Index (AI)). TCEQ uses the Tetra Tech (RTW) (Rothberg, Tamburini & Winsor) Model for Water Chemistry, Process & Corrosion Control by Michael R. Rothberg, P.E., D.E.E., "H.C." Hong-Chang Liang, Ph.D., Sarvin Tabatabaie and Joseph R. Tamburini, P.E. available from www.AWWA.org.

d) Provide water quality parameter (WQP) sample results that reflect the change in treatment or source. Provide WQP samples collected after the treatment modifications or during a small scale study. Include the date the treatment modification was first used and the sample collection date.

Water Quality Parameters

Analyte Code	Analyte Name
1927	Alkalinity
1919	Calcium
1017	Chloride
1064	Conductivity
1915	Hardness
1028	Iron
1032	Manganese
1925	pH *
1052	Sodium
1055	Sulfate
1996	Temperature in Celsius *
1930	Total Dissolved Solids (TDS)
1044	Orthophosphate **
1049	Silica **

*Requires in-field measurement.

**Requires measurement if a phosphate or silicate inhibitor is being used.

e) If the water is shown to be corrosive or slightly corrosive by the models, then the engineering report must provide the type of treatment recommended, including: type of chemical, dosage, residual and reason for the recommended treatment.

3. Future Conditions

If the PWS is planning future projects, those projects will likely impact the future finished water corrosivity and may change the system's recommendations and conclusions for implementing changes based on the system's current data.

The engineering report should include a section discussing all known future system modifications, such as new wells or treatment changes. Discuss when the projects are scheduled to begin and how these future changes may affect the finished water corrosivity, as well as whether the corrosion control recommendations and conclusions include consideration of any future projects.

4. Demonstration Study

In addition to the above-described desktop engineering report parameters, a demonstration study may need to be performed and should include one or more of the following analytical methods: scale and solids analysis, pipe loop testing, partial system testing, and coupon studies. For more information on these methods, refer to the Environmental Protection Agency's (EPA's) 'Optimal Corrosion Control Treatment Evaluation Technical Recommendations for Primary Agencies and Public Water Systems' (OCCT - see below) or the Internal Corrosion Control in Water Distribution Systems

Manual of Water Supply Practices, AWWA M58. [Ref. EPA's OCCT, Appendix F Section F2 and AWWA M58, pp. 109-128].

a) The following is a *recommendation* for determining if a demonstration study needs to be done:

1. If the PWS answers "yes" to only one of the questions below, then the PWS should not include a demonstration study.

Questions		**Yes or No**
i.	Are there multiple water sources?	
ii.	Is the PWS planning on future treatment changes in the next 2 years?	
iii.	Is the PWS planning for future source water changes in the next 2 years?	
iv.	Does the system have lead service lines, or not know if there are lead service lines?	
v.	If the PWS has multiple entry points, does the pH range greater than 1 pH unit between the entry points?	
vi.	Does the pH in the distribution system sample results vary more than 1 pH unit?	
vii.	Is the iron level at the entry point greater than 0.3 milligrams per liter (mg/L)?	
viii.	Is the manganese level at the entry point greater than 0.05 mg/L?	
ix.	Is the chloride to sulfate mass ratio for any sample set greater than 0.6?	

2. If the PWS answers yes to at least two of the questions listed above:

   i. If the PWS has a population of 10,000 people or fewer, then no demonstration study is required.

   ii. If the PWS has a population of more than 10,000 people, then a demonstration study should be included in the engineering report.

b) Note that EPA recommends a demonstration study, additional monitoring, or both for systems that recommend blended phosphate to control lead release.

5. Analysis and Technical Tools

The engineering report must include a corrosivity analysis of the WQP data.

a) As part of the report, the engineer must provide corrosivity calculations for evaluating the finished water corrosivity using such corrosivity indices as the LSI, RSI and the AI. Based upon the indices' results, the engineer must classify the new source as noncorrosive, slightly corrosive or corrosive.

b) The engineer might elect to utilize the Corrosion Model component of the Tetra Tech (RTW) Water Chemistry, Process and Corrosion Control Model. Additionally, the engineer may elect to use the Blended Water Model component of the Tetra Tech (RTW) Water Chemistry, Process and Corrosion Control Model.

6. Conclusions and Recommendations

The engineering report must indicate if the corrosive nature of the water is likely or unlikely to be problematic to the particular system.

a) The engineer must provide one of the following:

1. A new corrosion control treatment process;
2. Adjustment of the existing corrosion control treatment to impact WQPs; or
3. A detailed explanation as to why no new treatment changes are necessary for the existing treatment regime.

b) For new and existing corrosion control treatment changes, the engineer is requested to evaluate the treatment change in reference to the EPA OCCT (EPA816-B-16-003, March 2016). The document's Appendix B and Chapter 3 flowcharts can be used to determine the likely corrosion control treatment to work. If the engineer recommends a corrosion control treatment that is not within the EPA's likely treatment options to provide corrosion control, the engineer should provide an explanation for their recommended treatment choice. EPA's current OCCT recommendation document can be accessed from the following EPA web link:

www.epa.gov/sites/production/files/2016-03/documents/occtmarch2016.pdf

Finalized and Approved by:

5/7/18

Joel Klumpp, Plan and Technical Review Section Manager on 5/7/2018

If no formal expiration date has been established for this staff guidance, it will remain in effect until superseded or canceled.

Revision History:

Date	Action	Action by
December 9, 2016	Created	Jennifer K Dorsey
October 5, 2017	Reviewed	Regina Frisancho
December 29, 2017	Reviewed	Yadhira Resendez
January 2, 2018	Reviewed	Stephanie Escobar
May 7, 2018	Approved	Joel Klumpp